

Development of Hot Structures Materials for Inflatable Heat Shield, Phase I

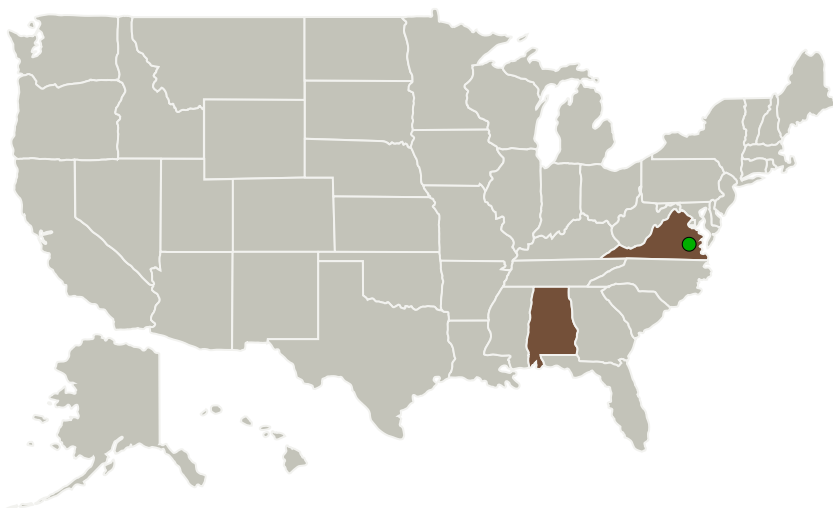
Completed Technology Project (2014 - 2014)



Project Introduction

Innovative low cost, lightweight, durable structural concepts that feature simple robust designs, efficient packaging, and assembly are critical to the development of pressurized inflatable systems for NASA future space explorations. Advanced development of high-temperature resistant fibrous material concepts that do not require parasitic thermal protection systems is essential to meet these goals. CFDRRC research team proposes a high performance Structural Inflatable Heat Shield (SIHS) featuring a flexible-deployable thermal protection system (FTPS) that simultaneously performs as mass-optimized hot structure capable of supporting the mechanical loads associated with atmospheric entry. The proposed innovation facilitates reduction of heat shield mass fraction by balancing the vehicle entry parameters with heat shield diameter to take maximum advantage of the shield's mechanical and thermal capabilities. Phase I effort will focus on identification and testing of high performance, high-temperature materials. An integrated test and analysis techniques will be utilized to fully characterize the hot materials for light-weight deployable structures and to fully capture the combined effects of processing, microstructure fiber geometry, temperature-related properties and performance. Phase II will focus on fabricating a subscale prototype of FTPS-based inflatable structure, and conduct extensive strain and thermal testing and analysis of the SIHS under different thermal and structural loading conditions.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
CFD Research Corporation	Lead Organization	Industry	Huntsville, Alabama
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

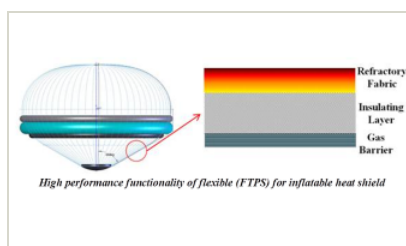
Primary U.S. Work Locations	
Alabama	Virginia

Project Transitions

**June 2014:** Project Start**December 2014:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/137549>)

Images

**Briefing Chart**

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(<https://techport.nasa.gov/image/127046>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

CFD Research Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

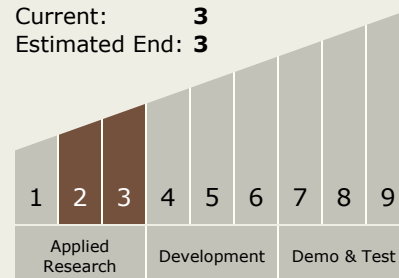
Carlos Torrez

Principal Investigator:

Essam Sheta

Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.1 Materials
 - └ TX12.1.1 Lightweight Structural Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System